

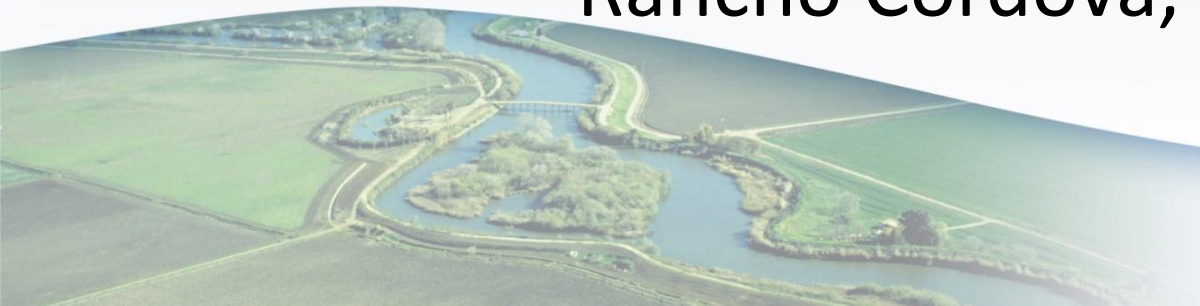


# Delta Mercury Control Program

## Methylmercury Study Planning Workshop

6 March 2012

Rancho Cordova, CA



# Study Planning Workshop Agenda

Welcome and Introductions (20 minutes)

Phase 1 Activity Summary (20 minutes)

Methylmercury Science in Delta and Data Gaps (120 minutes)

- Review Methylmercury Understanding – “knobs”

- Study Goals

- Knowledge and Data Gaps from Ongoing Research

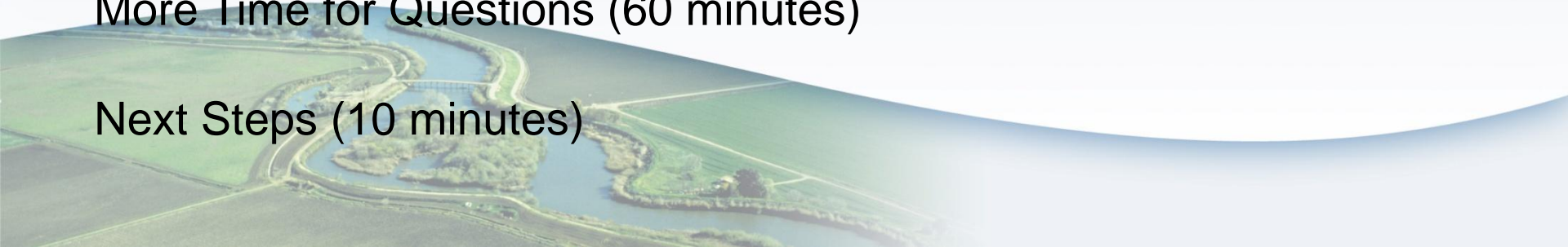
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Study Guidelines (40 minutes)

Study Plan Discussion (40 minutes)

More Time for Questions (60 minutes)

Next Steps (10 minutes)



# Delta Mercury Control Program (Basin Plan Amendment) Implementation

- Methylmercury allocations to point and nonpoint sources
- Methylmercury Control Studies
- Specific actions for inorganic mercury
  - NPDES facilities: mercury load caps, mercury minimization programs
  - NPDES urban runoff: pollution prevention and BMPs
  - Sediment Controls



# Phase 1

## TMDL Review

# Phase 2

2011

2020

2030

- Methylmercury Studies
- Pollution prevention for mercury
- Human Health Exposure Reduction Program
- Upstream TMDLs

Re-assess allocations  
& schedules.

- Implement methylmercury controls
- Pollution prevention and source control for mercury
- Exposure reduction
- Offsets Projects
- Upstream TMDLs



# Phase 1

- 7 years for Methylmercury Control Studies
- Board reviews TMDL and implementation program by 2020
- Exposure Reduction Program
  - Strategy due Oct 2012
  - Stakeholder discussions spring and summer



# Phase 1 Study Purpose

“Evaluate existing control methods and, as needed, develop additional control methods that could be implemented to achieve the methylmercury allocations.”

i.e., develop BMPs to reduce MeHg discharges  
via inorganic Hg or MeHg controls

**Use study results to adjust allocations and  
implement controls for Phase 2**





# Phase 1 Studies for

- Irrigated agriculture
- Managed wetlands
- Wastewater plants
- Storm water agencies
- State & federal agencies with jurisdiction over open water, water delivery, and flood management
- Dredging
- Cache Creek Settling Basin



- Guidance for organizational letters- due April 20
- General study and work plan guidance
- Technical advisory committee
  - Evaluate methylmercury study work plans and results





# Study Activities and Schedule

Date	Due
20 April 2012	Organizational Report
20 July 2012	Control Study Work Plan
20 April 2013 (if extended by Executive Officer for collaborative studies)	TAC 9/12
	TAC 5/13
By 20 November 2012 (or by 20 August 2013 if extended)	Initiate Control Study
20 October 2015	Control Study Progress Report
20 October 2018	Control Study Final Report
	TAC 11/15
	TAC 11/18

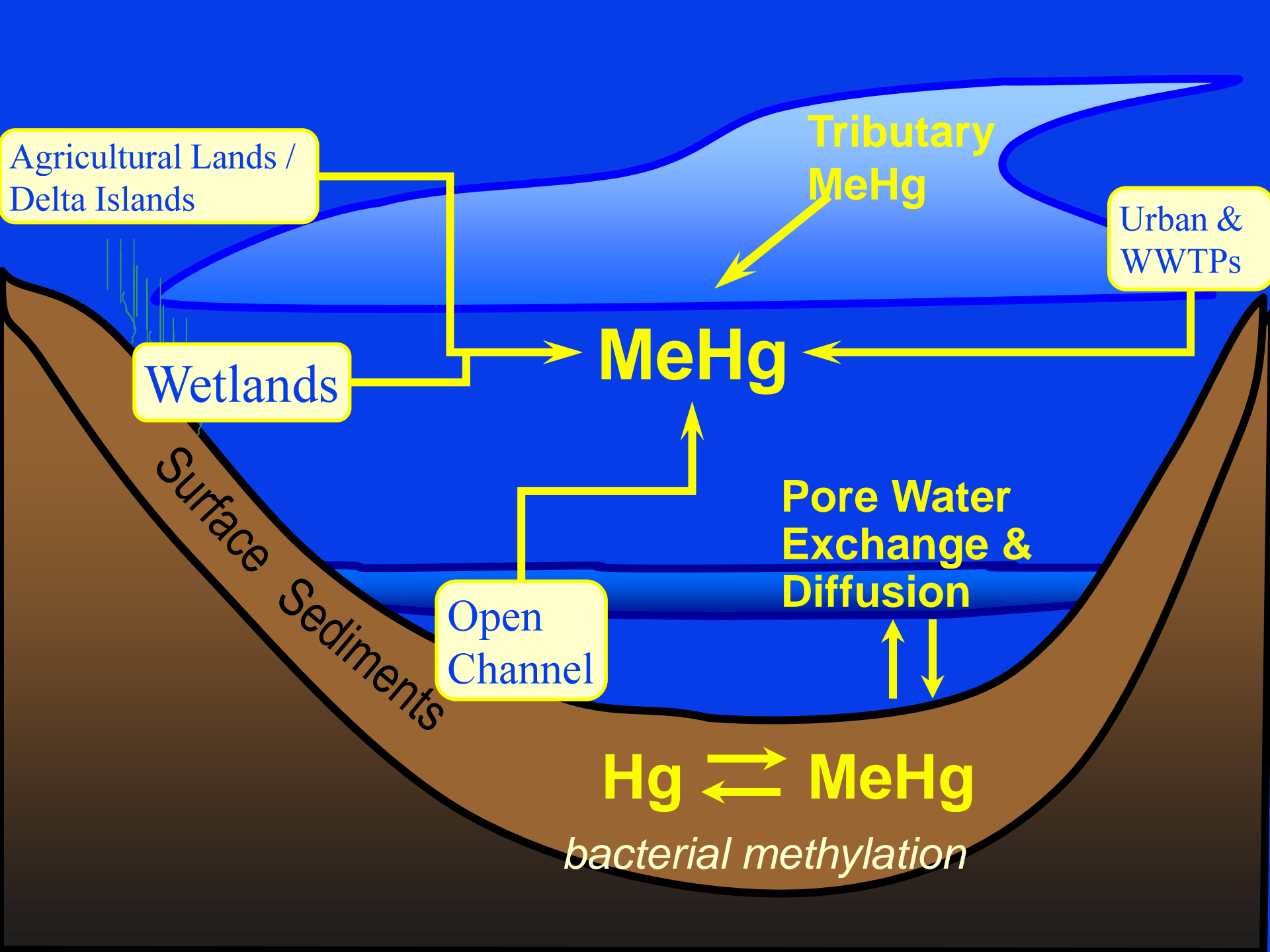
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# MeHg Science and Data Gaps

- Methylmercury Mass Balance
- Factors that may be controllable
- Ongoing studies and data gaps
  - Wetlands and Irrigated Agriculture
  - Permanent Ponds
  - Municipal Wastewater
  - Urban Runoff
  - Total mercury in Cache Creek Settling Basin





# Methylation

- MeHg = byproduct of the metabolism of sulfate- and iron-reducing bacteria typically in sediment, sometimes in water
- The amount of MeHg produced is a function of:
  - ◆ Bacterial methylation rate
  - ◆ Availability of reactive mercury
  - ◆ Availability of fuel for bacterial growth
  - ◆ Conditions that affect bacterial growth (e.g., nutrients, temperature, pH).



# Factors Controlling MeHg Production

- Availability of labile carbon
- Amount of permanent or seasonally flooded wetland and floodplain
- Sulfate concentration of the water
- Amount and kind of inorganic mercury present in the sediment



# Factors Controlling MeHg Loss

- Photodegradation of MeHg in the water column
- Particle settling

Promoted by long residence time





# **MeHg Control: Decrease “Food” (carbon)**

Decaying plant matter stimulates  
MeHg production

Possible control: Reduce plant matter  
before flooding by disking, mowing,  
scrapping, or grazing



# MeHg control: Wet/dry cycle

## Wetland design affects MeHg levels:

- Tidal versus non-tidal
- Portion that will be seasonally versus permanently flooded
- Depth of water
- Density and type of vegetation
- Flow regime
- Locations with high THg concentration in sediment



# MeHg control: Sulfate

- Sulfate additions have been observed to both stimulate and inhibit MeHg production
- Factors influencing sulfate concentrations:
  - ◆ Water quality objectives for electrical conductivity (EC)
  - ◆ Ratio of San Joaquin River to Sacramento River water

*Both are controllable water quality factors and result from water management decisions made by the State of California.*

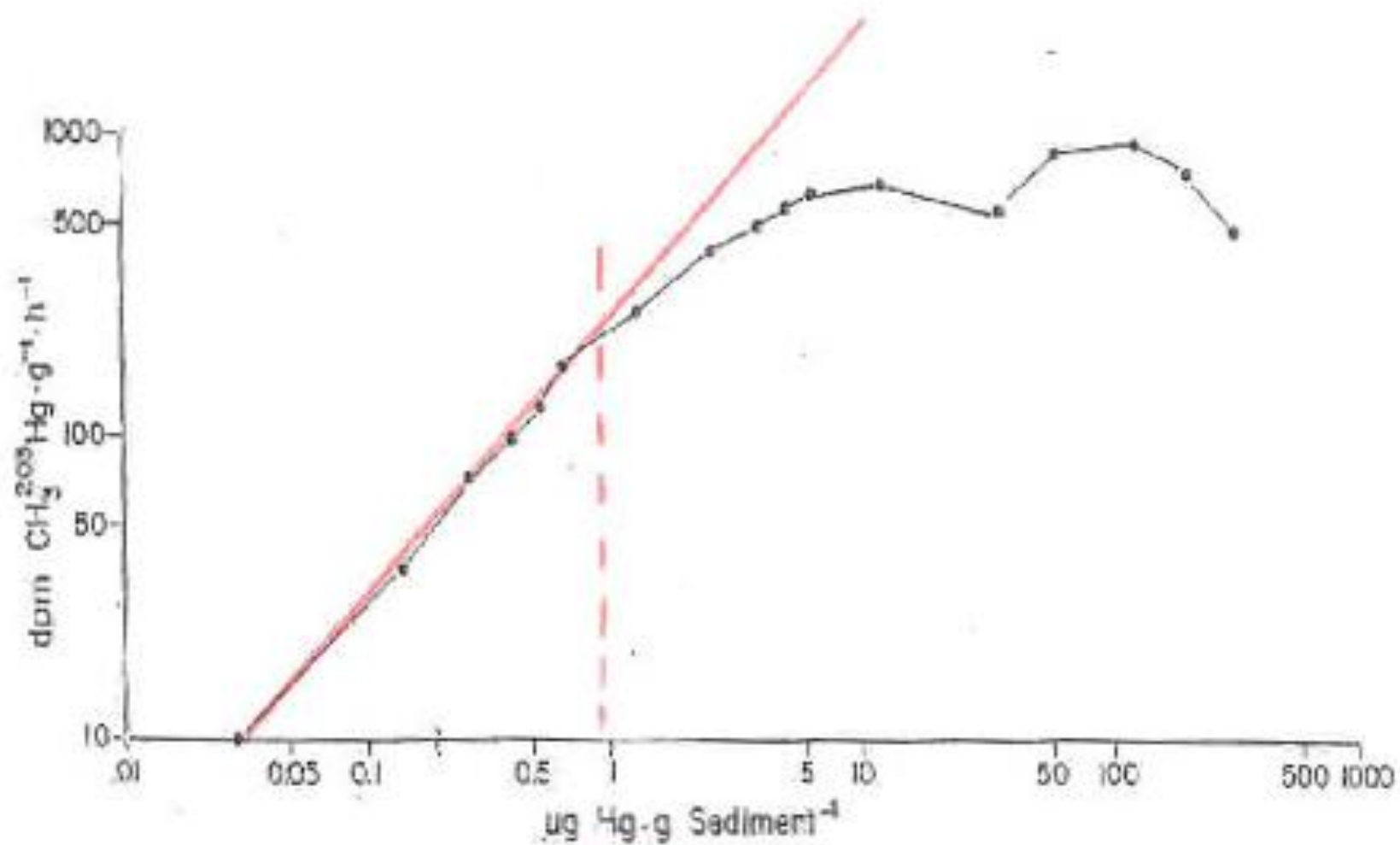
*Studies are needed to determine whether sulfate concentration in overlying Delta water affect MeHg production in Delta sediments.*



# MeHg control: Remove Total Hg

Reducing concentration of inorganic Hg in sediment will lower MeHg production





Influence of inorganic mercury additions in the laboratory on methylmercury production rates in sediment.

From Rudd *et al.*, 1983

# Methylmercury Science in Delta and Data Gaps

- Factors that can be controlled – Janis Cooke, Water Board
- Data Gaps and Expectations of Ongoing Research
  - NPS Workgroup – Stephen McCord, McCord Environmental
  - Wetlands and Irrigated Land Studies – Lisa Windham, USGS (*separate presentation*)
  - Permanent Pond Studies in Yolo Bypass – Wes Heim, CDFG (*separate presentation*)
  - Wastewater Treatment Facilities Studies - Debbie Webster, Central Valley Clean Water Association
  - Municipal Stormwater Studies - Hong Lin, City of Sacramento and Brian Laurensen, Larry Walker Associates (*separate presentation*)
  - Total Mercury Studies in Cache Creek Settling Basin – Fred Gius, DWR (*separate presentation*)





TAC Role: Review and provide comment to the Water Board regarding the scientific rigor, validity, and robustness of Methylmercury Control Study workplans and study results.

- provide advice regarding scientific and technical issues related to these studies
- evaluate conclusions drawn from studies
- As part of the final review, may be asked to suggest alternatives to the Board's mercury implementation plan.





# TAC Meeting Schedule

Event	Date
Control Study Workplan Review	Sept. 2012 May 2013
Four-year Progress Review	Nov. 2015
Final Report Review	Nov. 2018



# Methylmercury Control Study Guidance

- Purpose and Scope
- Schedule with due dates and TAC events
- Organizational Report content
- Minimum Content for Control Study Workplans
- *Content for optional “concept proposal”*
- Questions to Guide Study Development
- List of References and Ongoing Studies



# Minimum Content for Control Study Workplans

- Participants and Study Area
- Existing methylmercury information
  - Allocation and change needed to meet it
  - What is known about what is driving methylmercury in study area
- Management practices/activities to be tested
  - Phrase as hypothesis



# Minimum Content of Study Workplans

- Plan for Data Collection, Analysis, QA/QC, and reporting
  - Parameters, statistical evaluation
- Project Evaluation Plan
  - Describe environmental and climactic conditions during study (will enable later results report to estimate applicability under other conditions)
- *Optional* - Cost estimates



# TAC comments on Guidance & Study Workplan Requirements

- Research done elsewhere applicable to Delta
- More information about existing conditions and discharge
- Frame study questions as hypotheses
- Methods of data evaluation – statistical rigor
- How best address natural environmental variability
- What information besides change in MeHg loads is needed to evaluate effectiveness?

